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Point of View

Why Electric Trucks Matter:
A Comprehensive Analysis of the Benefits, Risks, and Solutions

Authors:

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Abstract

The electric truck is one of the most promising solutions in the transportation sector for decarbonization and a greener future. In the current scenario, trucks and buses are disproportionately large contributors to direct CO2 emissions, responsible for 35%, though they represent just 8% of vehicles [2]. In the wake of growing fears of climate catastrophes and environmental impact, adopting electric trucks is gaining significant traction and momentum. In this point of view, we explore the multitude of factors impacting the industry in the form of market dynamics, technological advancements, and government policies. We'll also highlight the challenges of transitioning to electric trucks and potential solutions. With stringent regulations, norms, and commitments, manufacturers need to expand their green offerings, regulators must create the right environment, and consumers must push for early adoption. Delays will have an adverse impact in the form of carbon taxes, brand perception, competitive disadvantage, and technological obsolescence.

The market

The electric truck market is poised to take off from about USD 2.4 billion in 2022 to USD 15.6 billion in 2030 with an impressive CAGR of 26.4 % [3]. Most of the demand for these trucks is in the transportation, logistics, and construction sectors. Though the growth was sluggish as a result of the pandemic and subsequent lockdowns, there have been clear signs of change, with several factors acting as tailwinds.

01 Focus on sustainability:

Almost all automotive manufacturers have made huge investments to reduce Green House Gas (GHG) emissions:

- While manufacturing the vehicle: In Japan, national automakers plan to cut emissions by 80% by 2050 as part of their automotive strategy [4].
- During usage on the road: Electric vehicles emit around 144 grams of carbon dioxide per mile [4], nearly half that of conventional gasoline and diesel vehicles. This will further reduce if renewable energy is used for charging the vehicle.

02 Changing consumer preferences:

A major factor that has nudged businesses towards electric vehicles has been the rising fuel prices that geopolitical tensions have spurred. Businesses have also become sensitive towards public perception and optics concerning their carbon footprint. Moreover, in the transportation sector, electric vehicles account for a quieter ride, significantly reducing the impact on the driver's hearing.

03 Government Initiatives:

Several incentives have been provided by various governments across the globe to promote electric vehicles. These include tax benefits to the buyers and subsidies and policy changes to benefit the manufacturers. **Some of them are:**

- **India:** Production-linked incentives and Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India (FAME) subsidies
- **China:** Purchase tax exemption to the tune of USD 72 billion over a period of 4 years [5]
- **US:** Tax credit for the purchase of electric commercial vehicles that is equal to 30% of the vehicle purchase price [6]

04 Battery cost and innovation:

Lithium-ion battery costs have reduced significantly from USD 1000 per kWh of usable energy in 2008 to about USD 153 in 2022 [7]. Statista estimates that the prices could drop to as low as USD 58 by 2030. However, these anticipated cost benefits also necessitate substantial research and innovation to continue advancing this technology. Potential areas for exploration include the development of sodium-ion batteries, lithium-sulfur batteries, solid-state batteries, and fast charging solutions, among other possibilities.

Challenges

Though the environment is highly conducive for the electric truck market, it has its fair share of challenges that must be addressed.

Range and payload:

Apart from range anxiety, which is a concern for all-electric vehicles, payload concerns are a big drawback for commercial and vocational fleets. This is especially true for long-range logistical use cases. Any additional weight can significantly drain the battery and impact the range. It has been observed that for light-duty electric pick-up trucks, a payload above 3000 pounds (which is about 35% of the gross vehicle weight) can decrease the range by 60-70% [8].

Manufacturing costs:

A combination of factors has resulted in higher upfront costs of electric trucks as compared to their traditional Internal Combustion Engine (ICE) counterparts for the specific categories and tonnage.

These include:

- Production processes and tools need to be designed and developed from scratch.
- Rapid changes and improvements in battery technologies will lead to frequent changes in vehicle parts, and software configurations.
- To address challenges regarding the range and payload, larger battery packs are being used by manufacturers. However, this will increase the battery weight and decrease the available cargo weight.

Charging infrastructure:

A critical factor that will impact the economic feasibility of commercial fleets is the availability of sufficient charging infrastructure. The lack of sufficient charging stations is an entry barrier for small scale fleet operators to transition to electric. Large investments and funding would be required from both the government and private players. Utility companies and grid operators will have to brace for increased demand.

Mixed fleet conundrum:

While all the major truck manufacturers have a portfolio of electric trucks and the fleet operators have lapped up these offerings, the real challenge would be managing a fleet of electric and ICE trucks. This would pose significant hurdles regarding route optimization, maintenance requirements, and workforce training.

Maintenance:

Electric vehicles require significantly less maintenance than ICE vehicles because of fewer moving parts and fluids. However, the immediate questions that Original Equipment Manufacturer (OEM) dealerships will have is about restructuring the service bays of their existing dealer network and investing in new dealership outlets dedicated to electric trucks.

Skilled workforce:

Compared to ICE, there is a shortage of skilled service technicians for electric trucks. Battery technologies are evolving rapidly, and these trucks typically have components that rely heavily on software. They also have additional modules, such as regenerative braking. Time and resources will have to be spent on training the workforce to meet future requirements.

Solutions

While there are several challenges, several solutions are being developed and considered for mitigating them.

01 Fast charging:

A recent research study [9] has indicated that the competitiveness of heavier electric vehicles can be improved with the availability of fast charging. With battery technology rapidly developing, it could enable smaller battery packs, which would significantly improve the economics per ton-kilometer. Several companies, such as WattEV in the US, are focusing on electrifying heavy-duty transport and investing significant sums of money. In the short run, electric trucks would be ideal for last-mile delivery in urban areas and short-distance use cases.

02 Autonomous vehicles:

Major truck manufacturers and start-up companies such as Aurora and TuSimple are actively developing self-driving technology. Electric trucks with autonomous driving capabilities will bring in greater efficiency with added advantages such as ease of use and reduced human errors.

03 Swappable batteries:

In their nascent stages, swapping batteries of electric trucks has been achieved in less than 5 minutes, and wider adoption could reduce range anxiety. However, unifying battery standards is the critical success factor for scaling this solution. This could pave the way for rapid adoption of heavy-duty trucks for long distances if implemented.

04 Telematics:

With the inherent complexities of supervising a mixed fleet, telematics would be important in mitigating many of these hurdles. **It would enable having clear visibility on:**

- Which trucks in my fleet are electric?
- What is the State of Charge (SOC) for trucks on the road?
- On-demand diagnostics.
- Route optimization based on the available charging infrastructure.
- Prognostics for smooth functioning and extending the life of the truck.

05 Policy changes:

The government will have a crucial role to play in developing the electric ecosystem in a variety of areas, such as:

- Co-located solar and storage to reduce the impact on the grid.
- Dynamic pricing of electricity based on peak grid consumption.
- Green loading zones
- Workforce training in electric vehicles and charging infrastructure

Conclusion

The outlook for this industry is overwhelmingly positive because of the impact on the environment (or lack thereof), the market size, the focus on research, and the solutions being developed. While there are immediate concerns about rising electricity costs, prices of lithium, and the introduction of electric vehicle taxation, we need to transition to electric and other green forms of energy. The long-term benefits of reduced GHG emissions and lower operating costs far outweigh the abovementioned challenges and concerns. More importantly, we must create a sustainable and environmentally conscious transport ecosystem.

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Pravin is a Specialist Consultant with LTIMindtree's Manufacturing Consulting unit. He has a bachelor's degree in mechanical engineering from the National Institute of Engineering, Mysore. After working in the automotive industry, he completed his postgraduate degree in management from the Great Lakes Institute of Management, Chennai. His expertise includes automotive after-sales, digital strategy, enterprise architecture, and business research, analysis, and development.

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